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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/032,275	12/21/2001	Alain Duboust	005998	4052
32588	7590	08/04/2004	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			PARSONS, THOMAS H	
			ART UNIT	PAPER NUMBER
			1745	
DATE MAILED: 08/04/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/032,275	Applicant(s) DUBOUST ET AL.	
	Examiner Thomas H Parsons	Art Unit 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 30 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12-34 is/are allowed.
- 6) ☒ Claim(s) 1, 5, 11 and 43 is/are rejected.
- 7) ☒ Claim(s) 2-5 and 7-10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114.

Applicant's submission filed on 30 April 2004 has been entered.

Priority

2. Receipt is acknowledged of papers filed under 35 U.S.C. 119 (a)-(d) based on an application filed in the Republic of China on 10 April 2001. Applicant has not complied with the requirements of 37 CFR 1.63(c), since the oath, declaration or application data sheet does not acknowledge the filing of any foreign application. A new oath, declaration or application data sheet is required in the body of which the present application should be identified by application number and filing date.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 99/65072 in view of Marosi (3,239,441).

Claim 43: WO 99/65072 discloses a method for electrochemically polishing a wafer, comprising providing a wafer having metal atoms disclosed on a surface thereof, disposing the wafer in an electrolyte solution; flowing the electrolyte composition through a process to remove the metal ions from the solution; and recycling the electrolyte solution to the surface (abs.; page 5, lines 1-10; page 15, line 32 through page 16, line 3; and page 17, lines 15-17).

WO 99/65072 does not disclose an ion exchange resin to remove metal ions from solution

Marosi in Figure 1A discloses an ion exchange resin to remove metal ions from solution (col. 7: 21-col. 8: 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the process of WO 99/65072 with the ion exchange resin of Marosi because Marosi teaches ion exchange columns that would have provided a means for regenerating the electrolyte by removing copper ions from solution and a means for the recovery of the metal ions in a form such as to allow some other uses thereof thereby improving the overall performance and efficiency of the process and provide economic advantages.

3. Claims 1, 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' Prior Art Admission in view of WO 99/65072.

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Claims 1 and 11: The Applicants' disclose in the Background section of the instant specification a method for planarizing a surface of a wafer, comprising polishing the wafer in an electrolyte wherein the wafer is connected to an electrical power source (page 2, paragraph [0004]).

The Applicants do not disclose an electrolyte composition comprising a phosphate system having a pH from about 3 to about 10, and removing copper atoms from the water.

WO 99/65072 discloses an electrolyte composition comprising a phosphate system (e.g. ammonium tripolyphosphate and ammonium phosphate) having a pH from about 3 to about 10 (e.g. 6.5, 7.5, 8 and 9) (page 17, line 18 through page 18, line 1), and removing copper atoms from the water (page 17, lines 15-17).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the electrolyte of the Applicants' Prior Art with the electrolyte of WO 99/65072 because WO 99/65072 teaches an electrolyte that would have allowed for the purification and recirculation of the electrolyte by removing the majority of copper ions from the electrolyte prior to returning it to the workpiece thereby improving the overall performance and efficiency of the process.

Claim 5: In addition, the Applicants' do not disclose in the Background section of the instant specification an electrolyte an electrolyte composition comprising about 2 to about 30 by weight of the phosphate system in volume of total solution.

WO 99/65072 discloses that one skill in electropolishing can readily further optimize the operation of the present invention by selecting alternate chemistries (i.e. composition, concentration, pH), and varying the voltage, current, and scan speed. Therefore, it would have

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been within the skill of one having ordinary skill in electropolishing to optimize the planarization process by selecting an electrolyte composition comprising about 2 to about 30 by weight of the phosphate system in volume of total solution depending upon the metallization layer and the level of polished desired.

Allowable Subject Matter

4. Claims 12-34 and 36-42 are allowable over the prior art of record.
5. Claims 2-5 and 7-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Reasons for Indicating Allowable Matter

6. The following is a statement of reasons for the indication of allowable subject matter:

WO 99/65072 discloses an improved method of planarizing a semiconductor wafer wherein the electrolyte composition comprising a phosphate system (e.g. ammonium tripolyphosphate and ammonium phosphate) having a pH of 6.5, 7.5, 8 or 9. The electrolyte of WO 99/65072 does not comprise ammonium dihydrogen phosphate, diammonium hydrogen phosphate, or a mixture thereof. Nor does it comprise additives.

U.S. Patent Nos. 6,273,786; 6,419,554; 6,551,935; 6,676,484; and US Application Serial No. 2001/0016469 disclose a chemical-mechanical polishing (CMP) method for planarizing the surface of a wafer comprising polishing the wafer in a nonelectrolytic polishing slurry comprising a tungsten oxidizing agent, a pH buffer such as ammonium citrate and

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ammonium phosphate, a surfactant, a thickener, a tungsten complexing agent such as triethylenediamine, ammonium citrate, ammonium phosphate, and ammonium oxalate, and a tungsten corrosion inhibitor such a phosphate.

In accordance with the method of the prior art, a wafer is positioned within a CMP apparatus comprising a fixed abrasive pad. With the polishing slurry received intermediate the wafer and pad the tungsten layer is chemically-mechanically polished with the pad. One or both of tungsten and tungsten oxide from the tungsten comprising layer is polished with a fixed abrasive chemical-mechanical polishing pad. The oxidized tungsten might oxidize on the layer prior to removal, or be polished away from the layer as tungsten and be oxidized and dissolved in solution thereafter.

In contrast, the instant invention is directed toward a method of planarizing the surface of a wafer wherein the wafer is connected to a positive terminal of a power source and subsequently disposed in the electrolyte. Material is then removed for the surface of the wafer.

The prior art references disclose a nonelectrolytic method of planarizing a wafer surface in the presence of a polishing slurry that oxidized the surface whereas the instant invention is directed toward an electrolytic planarization method wherein material is removed from the surface by electrochemical dissolution.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas H Parsons whose telephone number is (571) 272-1290. The examiner can normally be reached on M-F (7:00-4:30) First Friday Off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Pat Ryan
Supervisor
Technology Center 1700

Thomas H Parsons
Examiner
Art Unit 1745
